DOCUMENT RESUME

ED 150 152 TM 006 520

AUTHOR Miree, Lucia F.; Kibler, Robert J.
TITLE The Adaptation of Formative Evaluation Procedures from Mastery Learning to Nonmastery Learning Systems or "You Really Gotta Wanna".
PUB DATE Apr 77
NOTE 18p.; Paper presented at the Annual Meeting of the American Educational Research Association (61st, New York, New York, April 4-8, 1977)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Conventional Instruction; Course Evaluation; Educational Philosophy; Elementary Secondary Education; *Formative Evaluation; Individualized Instruction; *Instructional Systems; *Mastery Learning; *Models; Student Evaluation; Teacher Role
IDENTIFIERS Blooms Taxonomy

ABSTRACT

While formative evaluation is widley used in the field of instruction, the procedures for adapting formative evaluation from a mastery to a traditional, or nonmastery, learning system have not been clearly specified. This paper defines formative evaluation and its related functions following Bloom's model, describes the myths of applying Bloom's formative evaluation to the conventional instructional setting, and discusses procedures for adapting formative evaluation procedures from the mastery model to the nonmastery system. The implications of this adaptation process are also identified. (Author/MV)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

ED150152

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Lucia F. Miree

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

# The Adaptation of Formative Evaluation Procedures from Mastery Learning to Nonmastery Learning Systems or "You Really Gotta Wanna"

Lucia F. Miree
Department of Human Communication
The University of Kentucky

Robert J. Kibler
Department of Instructional Communication
The Florida State University

for
The Annual Meeting of the American Educational Research Association,
April 4-8, 1977, New York

TM 006 520

© Lucia F. Miree & Robert J. Kibler, 1977.

Abstract

While the use of formative evaluation is widely accepted in the field of instruction, the procedures for adapting formative evaluation from a mastery to a traditional, or nonmastery, learning system are not clearly specified. This paper defines formative evaluation and its related functions following Bloom's model, describes the myths of applying Bloom's formative evaluation to the conventional instructional setting, and discusses procedures for adapting formative evaluation procedures from the mastery model to the nonmastery system. A summary statement identifies implications of this adaptation process.

## Introduction

Formative evaluation has become an established practice employed in the systematic development and implementation of instructional systems. Even so, some confusion remains over the definitions applicable to and uses of formative evaluation by instructional designers. Scriven (1967) first used the term to describe the data collected for use in the design and development of modules, courses or curricula. Bloom (1968) later borrowed Scriven's term and redefined formative evaluation within the context of a mastery learning system to mean brief tests or measures used as aids in a course to facilitate more effective student learning. More recently, others have modified these earlier definitions slightly, expanded upon the purposes and combined the types of formative evaluation (Baker, 1974).

Although the lack of precision in defining formative evaluation is in itself a sufficient problem, the confusion in defining formative evaluation is further compounded by the differences in the operational processes and procedures required to implement the two major types of formative evaluation. Frequently instructional designers are perplexed regarding what type of formative evaluation is under consideration and how it is operationalized. Various procedures for using Scriven's formative evaluation for course design and development (Scriven, 1967) are fairly easy to adopt for a wide variety of instructional systems and conditions. Conversely, while Bloom's (1968) formative evaluation procedures are maximally effective within a mastery learning system, they are difficult to adapt to instructional settings that deviate substantially from Bloom's learning model.

There is a conspicuous absence of useful literature to aid instructional designers in adapting formative evaluation procedures implicit in the mastery learning system to nonmastery systems. If instructional designers are to adapt Bloom's formative evaluation procedures, it is necessary to begin to identify problems that emerge in this process and to delineate their implications.

Accordingly, the purposes of this paper are to: (1) review selected assumptions on which Bloom's model is based, the established definitions of formative evaluation in instruction, and the functions of formative evaluation within a mastery learning model; (2) identify myths about the applicability of Bloom's formative evaluation procedures to conventional or nonmastery instructional settings; and (3) discuss the implications for adapting formative evaluation methods from the mastery learning model to conventional instructional environments.

## An Overview of Formative Evaluation

The basic assumptions and a description of mastery learning are reported here along with definitions and functions which formative evaluation serves within the mastery learning model. From this information and a comparison with conventional or nonmastery learning systems, the myths and implications of using Bloom's formative evaluation will emerge and be discussed in detail.

## Essential Assumptions of Mastery Learning

Before beginning the formal discussion of formative evaluation, it may be useful to review briefly some of the essential assumptions which Bloom presents as an integral part of his mastery learning model (1968). There is no intention on the part of the authors to imply that these are all of the critical assumptions of the model; rather, the attempt here is to infer from existing literature those assumptions concerning the mastery learning model which are salient to differentiating it from nonmastery instructional systems--sometimes referred to as conventional or traditional learning systems. Selected assumptions for a mastery learning model are listed with their corollaries from a nonmastery system in Table 1.

Table 1

Assumptions of Mastery and Nonmastery Learning Systems

| Mastery System | Nonmastery System |
|---|---|
| 1. Students differ in their aptitudes and abilities for learning and are paced and assessed on individual bases. | 1. Students differ in their aptitudes and abilities for learning, but are paced and assessed by a common procedure. |
| 2. Instruction is designed for individual styles in learning and competencies. | 2. Instruction is designed to be most effective and efficient for most students. |
| 3. Sufficient time is allowed for learning. | 3. Students must learn/not learn during a set time allocated for learning. |
| 4. Course planning is oriented toward desired terminal performances. | 4. Course planning is oriented toward the material to be covered. |
| 5. Instructors are accountable for how well students learn. | 5. Instructors are not accountable for student learning. |
| 6. The role of the instructor is primarily that of a learning manager, e.g., selecting and developing appropriate instructional strategies based on individual students' needs to achieve objectives. | 6. The role of the instructor is primarily that of an information dispenser. |

Note. Adapted from "A Comparison of Mastery and Traditional Learning Systems with Selected Implications for Speech Communication Instruction" by G. R. Spell, R. J. Kibler and A. M. Parks, presented at the 1972 meeting of the International Communication Association.

Bloom's model of mastery learning implies that there is a body of knowledge or skills required of all students. These are usually operationalized in the form of hierarchically structured goals and objectives. Alternative instructional strategies and materials are developed following general procedures explicated in the systems approach to designing instruction (Dick and Carey, 1976; Kibler et al., 1974; Gagne and Briggs, 1974). A level of performance is specified to identify when mastery has occurred and tests based on the objectives are used to assess that mastery. These mastery tests employ criterion referenced measurement for both the formative and summative evaluation. Formative evaluation measures are administered with high frequency following each unit of instruction, whereas summative evaluation measures are administered at the end of a unit of instruction and are analogous to final examinations. The functions of formative evaluation are principally to diagnose student entry behaviors and incourse progress. These diagnostic results are then used to determine which objectives have been mastered and which have not. These evaluation data are also used to provide opportunities for recycling, remediation and enrichment. Another key concept in a mastery learning model is that formative evaluation measures (tests) pace the learning of students and help motivate them to persevere until they have attained mastery of the specified objectives.

There is little argument about the usefulness or effectiveness of Bloom's techniques when employed within a mastery learning system; however, attempts to adapt the procedures to other learning systems produce problems for instructional designers. There is a tendency among some instructional designers to assume that if a process works within one instructional system it can be used and will work within other systems. Moreover, they tend to design instruction based upon this assumption. The adaptation of Bloom's formative evaluation to other instructional systems has proved no exception to this tendency. The result has frequently been a mindless transplantation of Bloom's formative evaluation procedures into a system which is not conducive to their application. The fault with such bastardized transplantations rests with the instructional designers' implementing the techniques, not with Bloom's conceptualization of formative evaluation or its employment within a mastery learning model. We emphasize that it is not our intention here to criticize Bloom's formative evaluation procedures as applied within a mastery learning system, but rather to identify the difficulties encountered by instructional designers when these techniques are applied to traditional or nonmastery systems.

## Definitions of Formative Evaluation

The uses of formative evaluation tend to fall into two major categories: Type I Formative Evaluation (FE I) deals with course design and review; Type II Formative Evaluation (FE II) is concerned with the diagnosis of student progress. FE I was defined by Scriven (1967) to refer specifically to the data collected for course design, revision or implementation. Those data collected for the assessment of the quality of the instructional sequences that have already been fully developed or completed fall into the category of summative evaluation (Scriven, 1967). FE II was defined by Bloom (1968) to

refer to those data collected to inform/help students achieve mastery of specified objectives, whereas summative evaluation refers to those data collected at the end of a time period to judge a student's learning or the effectiveness of the instruction. Of primary importance in this paper is the concept of formative evaluation and its role in the mastery learning model.

The essential difference between Scriven's and Bloom's definitions of formative evaluation is that FE I (Scriven, 1967) is designed to assess instruction still under development, whereas FE II (Bloom, 1968) uses the technique primarily for diagnosing student progress. Further differences are noted in Table 2.

Table 2

A Comparison of Formative Evaluation Types

| | FE I (Scriven) | FE II (Bloom) |
|---|---|---|
| Focus | course | student |
| Purpose | design and revision | diagnosis of progress |
| Participants | pilot group | course enrollees |
| When Administered | design stages | in course |
| Data Use | revising | feedback |

There are major differences in the application of the two principal types of formative evaluation. FE I can be used for the (a) initial design, (b) revision, (c) implementation, (d) transplantation, or (e) quality control of a module. FE II can be used to (a) identify objectives already mastered, (b) determine those objectives yet to be mastered, (c) help select the best alternative learning strategies for the student to master objectives, (d) provide feedback to direct learning for remediation and enrichment, (e) facilitate positive self-esteem about students' abilities to learn independently, and (f) help students to develop favorable attitudes toward learning and the subject area. Thus, there are two distinct, but equally important, applications of formative evaluation. While recognizing the importance of and necessity for FE I, this paper will concentrate on FE II, or formative evaluation as designed by Bloom (1968), its role in the mastery learning system and problems concerning its transplantation and adaptation from the mastery learning model to other types of instruction.

Functions of Formative Evaluation (FE II)

The mastery learning model is designed so that its components serve a number of purposes, all of which help insure efficient instruction and learning. The formative evaluation process or component in this system serves a variety of functions. It is important to understand the principal functions of formative evaluation within the mastery learning system because they serve as a basis for problems that occur when formative evaluation techniques are transplanted into nonmastery systems. Accordingly, some of the principal functions of formative evaluation in the mastery learning model are delineated here.

Formative evaluation:

1. helps students/teachers to pace student learning.
2. accommodates individual differences in learning.
3. facilitates long term learning.
4. provides opportunities for remediation and/or enrichment.
5. sequences learning for efficiency and effectiveness.
6. assesses students' progress fairly and systematically.
7. motivates students to spend more time learning.
8. reinforces effective learning skills.
9. reduces anxiety over summative evaluation measures.
10. helps to define the roles of the students and teacher clearly.
11. encourages the establishment/maintenance of an accountability system.

## Myths Regarding the Applicability of Formative Evaluation Procedures to Nonmastery Systems

Formative evaluation, as conceived by Bloom (1968), was designed for placement in a mastery learning system which approached an ideal learning environment. However, in practice instruction frequently takes place in public school systems or in universities which have constraints that deviate substantially from those implied in Table 1 for a mastery learning model. When FE II is applied to most present instructional settings, it becomes infeasible. Moreover, certain myths emerge as a result of transplanting formative evaluation procedures implicit in the mastery model to conventional or nonmastery learning systems. These myths fall into four broad categories and are as follows:

1. "Marching to the beat of different drummers," or myths about aptitude for learning:

   a. The instructor and student are not bound by time constraints.
   b. The instructor has the skill, time and instruments to assess accurately each student's learning aptitude and ability, and to then design instruction that conforms to these individual differences.

2. "Where there is a will, there is a way," or myths about the quality of instruction:

   a. The instructor has sufficient time and resources to devote to each student to insure learning.
   b. The instructor has error free measures to judge students' progress.
   c. The instructor can make absolute judgments about criteria.
   d. The instructor does not have to answer to the administration about high grade point averages.
   e. The instructor is not required to give traditional grades and may use pass/fail grades.

3. "To dream the impossible dream," or myths about motivation:

   a. Students are highly motivated and persevere.
   b. Students want to achieve at a high level.
   c. Frequent testing and prescriptions reduce anxiety and are beneficial.

4. "I never promised you a rose garden," or myths about the system:

   a. Students and instructors can be easily retrained to use a mastery learning system.
   b. The mastery learning model is a relatively easy system to use.
   c. The mastery learning model saves time.

The presence of these myths in the learning environment requires that the instructional designer make specific changes or adaptations when employing Bloom's formative evaluation procedures in a nonmastery learning system with all of the assumptions articulated in Table 1. Each myth is discussed, along with decisions to be made by instructional designers when adapting formative evaluation to the traditional learning system (Table 1).

"Marching to the beat of different drummers"

The mastery learning model is based on the assumption that students vary in their aptitudes for learning, i.e., time required to learn (Carroll, 1963), and in their abilities to learn certain tasks (Carroll, 1970). This assumption implies that operationally there should be enough time for each student--even the slowest--to master each required objective. However, the instructor usually works within a timebound system (e.g., quarter, semester or sixweek term) and must place limitations on the amount of time that can be allocated for a student to learn and/or demonstrate competency. Limitations imposed often include such procedures as setting deadlines and cutoff dates, restricting the number of recycling attempts and establishing the number of formative evaluation tests per unit of instruction. Students may be required to develop self discipline in pacing their time to learning, become more efficient in learning and accept a lower level of performance than desired because of time constraints.

These adaptations mean that the definition of aptitude as time required to learn is inappropriate in most non or modified mastery systems. Consequently there is a tendency to design instruction based on a more traditional view of aptitude. For example, in a modified mastery learning system, aptitude is probably defined somewhere between Carroll's (1968) definition as time required to learn and the more traditional view, i.e., the capacity to acquire proficiency as a result of formal or informal training.

In order to adapt to the individual differences of learners, the instructor must recognize, measure and adjust for varying students' abilities. This requires the skill and time to plan a course of instruction for each student individually based on a diagnosis of his/her present competencies. Few instructors have the time, ability or resources required to provide instructional packages designed for individual learning. They frequently are forced by time and skill constraints to design only one major instructional sequence, and to provide prescriptive options only at those points where time and ability differences become most critical. Most instructors also are not trained in instrument design and measurement and do not have the time to develop and test their own instruments. They must instead rely on standardized instruments or new instruments with questionable reliability and validity to determine the needs of each student.

Based on previous experiences with the system--and lots of intuition--the instructor must maintain the system continually. This requires tracking each student's learning progress carefully, identifying potential problems and correcting problems inherent in the system. Rather than designing systems for individual learners, the instructor tries to keep the student in the main

system and to identify points during instruction where the system might not meet the student's needs. The instructor can thus provide prescriptions to correct problems related to aptitude or ability and redirect the student back into the main stream of the instructional system. Regrettably, the consequence is that the instructors force the students to conform to the system rather than modifying the system to conform to the students.

"Where there is a will, there is a way"

The mastery learning model assumes that instruction will be of the highest quality and will conform to the previously prescribed functions of FE IV. This means that resources must be available, the instruction itself must be reasonably error free, the instructor must not be bound by a traditional grading system and administrators should not frown upon high grade point averages.

In the nonmastery or conventional educational system, however, there are serious limitations on the human and material resources that are available to an instructor. Even so, the adaptation of a mastery learning system requires a major investment of initial resources, as well as periodic updating of the system. Most instructors have had to implement a system in stages because of resource limitations. The result frequently is to restrict the efficiency of the system somewhat and to employ outdated materials.

The effective design of instruction is a long range, complicated process that requires a wide variety of instructional design skills. These skills range from objective identification, specification and sequencing to measurement through the development of the instructional product and its evaluation. Most classroom instructors do not possess all of these skills and depend on fellow instructors, previously designed courses, intuition and trial-and-error techniques.

The instructor must also make absolute judgments about the criteria used for determining mastery of material. This implies that criteria can be set for all mastery tasks and that instructors have the knowledge and training to set those levels. In practice, however, most instructors have considerable difficulty in establishing the level of mastery. They generally rely heavily upon the traditional grade system, so that an instructor may set mastery at 70 percent based on the traditional grading scheme of "C", or the average grade. From this established criteria, standards must be set and used for grade assignment instead of just for diagnostic purposes. Formative and summative evaluation techniques may be used, but at some point the instructor must convert these results to the traditional grading system to conform to the requirements for marking or ordering students.

"To dream the impossible dream"

Whether or not students are motivated and will persevere is of major concern to all instructors, not just those involved with mastery learning. Since frequent testing, self pacing and a substantial amount of interaction are essential in a mastery learning system, a great amount of effort is

directed toward keeping students interested and motivated.

Students must be motivated not only to persevere or finish, but they must also want to achieve at a high level. While an ideal mastery learning system insures that all students can master material at 75-90 percent (Block, 1971), it does not necessarily follow that students will spend extra time and persevere in order to achieve at a high level. Research has shown that many students are so convinced from previous experience that they cannot perform at high levels that they are unwilling to devote the time and energy required to improve their learning (Block, 1971). In addition, some students might actually prefer to settle for mastery at a lower level. A few students in our classes have opted to stop at the "D" level (65 percent) in order to devote more time to other activities. Whether it is a direct result of previous experience or of personal priorities, often students are not willing to sacrifice the time and effort to achieve a high level of mastery.

The use of formative evaluation techniques can motivate students by providing reinforcement and/or prescriptions to insure learning. However, the use of frequent testing might also cause considerable anxiety, or fear of evaluation, in many students. Even if the formative evaluation measures are not used for grading, their use in reducing final evaluation (summative) anxiety is questionable. Many students not only dislike evaluation, but also dislike interaction with an instructor on a frequent basis.

One assumes, often mistakenly, that students will benefit from the system and frequent formative evaluation. As demonstrated in high attrition rates, there are many students who do not respond favorably to the mastery learning model and thus do not persevere.

"I never promised you a rose garden"

The mastery learning model is based on a philosophy of education that differs considerably from the system in use in most American school systems. Many instructors have found it is a major problem to work with administrators when employing a mastery learning model. The problems in communicating about the system do not lie solely between administrators and instructors; the instructors and students can have just as many problems in adapting to the mastery learning system and the new roles required by the system. It is assumed that this adaptation or retraining can be achieved easily; however, changing previously established attitudes and behaviors is a difficult task. Adapting the FE II procedures to a conventional or nonmastery system (see Table 1) requires a major commitment in terms of attitudes and work involved--it requires a change in the instructional life-style of all involved in the educational enterprise.

Most students have been raised in an educational environment based on competition, grading and time constraints. To change this system suddenly places the student in a relatively unstable situation. The student must learn how the system works and his/her role in the system, and at the same time learn to master objectives. The instructor, on the other hand, must also be retrained to use the mastery learning model and to adapt his/her teaching methods to the system. This retraining process can be very time-consuming and can, at

times, interfere with the actual content learning.

The interaction of the students and instructor also takes place differently in the mastery learning model. The student must see and use the instructor as a manager of instruction, instead of as a teacher. The instructor must see the student as learning through the directed learning experiences facilitated by the instructor. Unless these roles and responsibilities are accepted, the model will not function effectively.

Some designers of instruction and instructors hold a mistaken notion that using a mastery learning system is relatively easy. While assumptions and functions of this system are straightforward, its implementation and supervision are extremely time-consuming and trying. Even after the initial design and use, the instructor must continually update and adapt materials. The instructor must also interact frequently with students--much, much more than in the conventional setting. Therein lies much of the reward of implementation. Even so, if all courses in the curriculum were based on mastery learning models, interaction would probably decline due to time constraints or greater efficiency in learning by more highly motivated students.

## Conclusions

Acceptance of the mastery learning philosophy and model requires a true believer's commitment to efficient instruction. Few rewards are provided in the bureaucracy for quality instruction and few resources (material and human) are allocated to facilitate effective/efficient instruction. Even more discouraging is the realization that the use of a mastery learning model may result in considerable criticism from administrators, fellow instructors, parents and students. The system also necessitates a strong commitment on the part of the instructor because designing, implementing and supervising a mastery learning system are not easy tasks. Each assumption and function is clouded by a number of myths that add to the complexity and difficulty of the task. With various adaptations to overcome these myths and constraints imposed by the conventional educational system, the mastery learning system can work well. The instructional designer must remember that the mastery learning model is just that--a model. This model must be carefully examined, dissected and rebuilt to incorporate the constraints of each school system for each course.

Very few school systems have adapted mastery learning strategies because their use involves major ideological changes among administrators, instructors and students. The prevalent educational model today is based upon competition and the need to separate students based on their capabilities. It focuses on rewarding only the best learners, instead of all learners, and embraces the traditional concept of aptitude. This process can result in many students having years of unrewarding school experiences, and developing negative attitudes regarding content areas and learning itself.

Conversely, the mastery learning model emphasizes cooperation and individual learning. It provides rewards for all learners, creates learning experiences that reinforce learning skills, and helps foster positive attitudes toward learning and the content areas. By acknowledging that all students can learn,

the burden of insuring this learning shifts to the school system. Its function then becomes that of providing experiences that insure that all students learn (Block, 1971) and being accountable for that learning. The students recognize this new emphasis in which the educational community is committed to their learning; they begin to learn more efficiently/effectively--and like it.

References


Airasian, P. W. The role of evaluation in mastery learning. In J. H. Block (Ed.), Mastery learning. New York: Holt, Rinehart and Winston, 1971, 77-88.

Baker, E. Formative evaluation of instruction. In W. J. Popham (Ed.), Evaluation in education. Berkeley: McCutchan, 1974, 533-585.

Block, J. H. Operating procedures for mastery learning. In J. H. Block (Ed.), Mastery learning. New York: Holt, Rinehart and Winston, 1971, 2-12.

Bloom, B. S. Learning for mastery. Evaluation comment, May, 1968, 1.

Bloom, B. S. Mastery learning. In J. H. Block (Ed.), Mastery learning. New York: Holt, Rinehart and Winston, 1971, 47-63.

Bloom, B. S. Recent developments in mastery learning. Educational psychologist, 1973, 10 (2), 53-57.

Bloom, B. S. Time and learning. American psychologist, September, 1974, 682-688.

Bloom, B. S., Hastings, J. T., & Madaus, G. F. Handbook on formative and summative evaluation of student learning. New York: McGraw Hill, 1971.

Carroll, J. B. A model of school learning. Teachers college record, 1963, 64, 723-733.

Carroll, J. B. Problems in measurement related to the concept of learning for mastery. Educational horizons, 1970, 48, 71-80.

Dick, W., & Carey, L. M. The systematic design of instruction. Tallahassee, Florida: Florida State University, College of Education, 1976.

Gagne, R. M., & Briggs, L. J. Principles of instructional design. New York: Holt, Rinehart and Winston, 1974.

Kibler, R. J., Cegala, D. J., Barker, L. L., & Miles, D. T. Objectives for instruction and evaluation. Boston: Allyn and Bacon, 1974.

Scriven, M. The methodology of evaluation. AERA monograph series on curriculum development, 1967, 1.

Spell, G. R., Kibler, R. J., & Parks, A. M. A comparison of mastery and traditional learning systems with selected implications for speech communication instruction. Paper presented at the annual meeting of the International Communication Association, 1972.

Stufflebeam, D. L. Alternative approaches to educational evaluation: A self-study guide for evaluations. In W. J. Popham (Ed.), Evaluation in education. Berkeley: McCutchan, 1974, 97-143.